NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
400 MARYLAND AVENUE, SW, WASHINGTON 25, D.C.
TELEPHONES: WORTH 2-4155——WORTH 3-1110

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Address
by
James E. Webb, Administrator
National Aeronautics and Space Administration

IOWA BANKERS ASSOCIATION
77th ANNUAL CONVENTION
Hotel Fort Des Moines
Des Moines, Iowa
October 23, 1963

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The opportunity to be with you for the 77th Annual Convention of your association is a welcome one. It is always a privilege to meet with business and civic leaders to consider the great challenges which confront our nation in space.

It is an even greater pleasure, however, to meet with a distinguished group of citizens from the state of Iowa, because from its earliest days, our national space program has received some of its most significant scientific support from one of the great universities of your state.

I refer, of course, to the fact that Dr. James Van Allen, a native son of Iowa, and his colleagues in the Department of Physics and Astronomy at the State University of Iowa, were responsible for the experiment which produced the first striking discovery of the space age.

It was Dr. Van Allen and his associates, flying an experiment on the first United States satellite, who established the existence and location of the great radiation belts around the earth. Just as Halley's comet has been identified since 1682 with the name of its discoverer -- and will be for all time -- so will the Van Allen belts be identified with a distinguished scientist from Iowa, and with a great university of this state.

The keenness of international competition in space is pointed up by the fact that the Russians might well have earned the right to name the Van Allen belt.

The instruments which discovered the inner radiation belt, developed at Iowa State, were flown on Explorer I, which was sent aloft on January 31, 1958. The Russians had instruments which might have made the discovery on Sputnik II, which went up three months earlier, but did not go high enough to pass through what the world now knows as the Van Allen belts.

Every citizen of Iowa can take great pride in the fact that this state which is noted for agriculture also produces men and women who are at the forefront of mankind's advance into space. The modern pioneering spirit demonstrated at the State University of Iowa and your other institutions of higher learning shows that the climate is right in Iowa for many types of growth -- including the growth of the intellectual resources upon which the future greatness of our nation will in large measure depend.

I consider it an especial challenge and opportunity to address a gathering of bankers here in the heartland of the nation at this particular time. Your primary interest in business is that your banks, and the customers of your banks, invest wisely. And as citizens with an expert knowledge of fiscal affairs, you play a leading role in insisting that the national resources of this country are also wisely invested and put to good use.

Some people have the mistaken idea that bankers, because they so often have to say no, are by nature negatively minded. But anyone who gives this a moment's serious thought knows that a banker could not earn a penny, and could not do a bit of good in his community, if all he ever said was no. A bank thrives, and a community prospers, only when the banker says yes a good proportion of the time -- yes to the right thing at the right time.

Our nation is like a bank in this respect. As a people, we have resources, and skills, and tax dollars to invest. The President and the Congress have to know when to say yes, too -- but also to the right thing at the right time.

I am sure it is no secret to you that what I want to say here today is that this is the right time for a substantial national investment to explore space and to make use of space. If we intend to remain a free nation, and to grow to be an even greater nation, if we prove true to our pioneering heritage, America's answer to the challenge of space must continue to be a clear yes.

I shall endeavor to make my case today in banker's terms: Why must we invest in a national space program and what return are we getting on this investment? I have called these banker's terms, but they are the same questions that any thoughtful citizen wants answered.

The ability to enter space opened to man almost unbelievable opportunities to secure new knowledge in the most basic of scientific areas. For the first time it was possible to study in detail the earth's atmosphere and the areas beyond; to examine and measure the sun and its activity with great accuracy and thus to begin to understand its fundamental nature and influence on the earth.

Beyond this, there was opened the possibility of determining the origin and nature of the solar system; the nature of the stars and galaxies; and perhaps even the origin of life itself. In a world where it has become even more obviously vital for scientists to pursue knowledge for its own sake and for nations to seek its practical uses, the prospects of space exploration in both areas could not be ignored.

It was also apparent that in space there exists a military potential at least as important as that in the atmosphere. To fail to develop this potential, and thus to allow it to become the sole possession of the U.S.S.R. or any other nation would have been to invite domination through space by that nation.

It was also clear that space exploration offered immediate practical uses. Satellites that would carry communications across countries and oceans and hemispheres became entirely conceivable. Predictable, also, was the day when satellites would photograph and send back to earth the cloud patterns and other information from which weather forecasts could be made with an accuracy that could not have been dreamed of earlier.

For these reasons, the United States made a national decision, with the passage of the National Aeronautics and Space Act of 1958, to establish the basic capability to enter space, to operate there, to take knowledge from that environment, and to do all other things essential in the National interest and welfare. This was a decision demanded by the facts of the situation -- a decision whose wisdom and, indeed, inevitability, has been confirmed by the march of history. It was a decision from which there can be no turning back. The United States must achieve mastery of space. Our national security requires it. Our scientific and technical leadership requires it. The welfare of future generations in a world of science and technology requires it.

In the five years since the passage of the National Aeronautics and Space Act, we have come a long way toward leadership in space. The program has been bipartisan. It was begun under one Administration, and it was accelerated under a succeeding Administration, as events indicated the necessity of achieving the original objectives in a shorter time than originally envisioned.

When the Soviet Union orbited Sputnik I, we could see at once that the Russians possessed launch vehicles having tremendously greater thrusts than any we had developed. There were two main reasons for this Russian advantage. They started several years ahead of us to build intercontinental ballistic missiles, and they decided to build much heavier missiles than we did.

We have been able to satisfy our military requirements with the Atlas, Titan, Minuteman, and Polaris type, which are much smaller -- and incidentally, more economical to build -- than the big rockets the Russians felt they needed.

We got the missiles we needed to maintain our effective nuclear deterrent. Whether the Russians made a military error in building such large rockets, only they can answer. But at least they had the advantage of having a large launch vehicle available for space use at the very beginning of the space age.

During the past five years, we have made great progress in overcoming this initial deficiency. As a result of a driving effort on the part of an American industry-government team, we have now had four successful flight tests of the first-stage Saturn I rocket. Before the year is out we will have flown it again, this time with its second stage. Saturn I produces 1½ million pounds of thrust, and will, so far as we know now, be the most powerful booster in the world.

Meanwhile, we have placed under contract all the major components of the Saturn V, the 7½ million-pound-thrust booster, and are well along with its development. Saturn V will afford this country very great capability to operate spacecraft in space near the earth and will also provide the thrust to send the first American explorers to the moon. This huge rocket will be powerful enough to place in earth orbit a weight equivalent to that of 80 capsules such as the one in which our Project Mercury astronauts orbited the earth.

While going forward rapidly with the large boosters, we have also made substantial progress in developing the spacecraft required for the Gemini and Apollo programs.

In Gemini, a two-man crew will be able to remain in earth orbit as long as two weeks. In Apollo, a three-man crew will be able to remain in orbit around the earth for up to two months, and ultimately to break the bonds of the earth's gravity and depart for exploration of the moon.

You may be interested to know that our astronauts are scheduled to spend 2,000 hours in near-earth orbit, learning to maneuver and to rendezvous and join spacecraft in flight before the first crew sets out for the actual voyage to the moon. The importance of this experience becomes apparent when you consider that the total flight time of all the six Project Mercury astronauts totaled less than 55 hours.

While proceeding with launch vehicle and spacecraft development, we are also constructing the installations required to assemble, test, and launch them, and the facilities to train the astronauts and to provide the control required during the flights. These facilities include the Manned Spacecraft Center in Houston, the Michoud assembly plant at New Orleans, the test facility in nearby Mississippi, and the new launch pads at Merritt Island, north of Cape Canaveral in Florida.

These facilities include some of the most massive and complex ground engineering installations ever designed. For example, the Vertical Assembly building at Cape Canaveral, in which the Saturn V rocket will be assembled in an upright position, will be 525 feet tall. The cubic content of this one-story building will be greater than that of the Empire State Building and Chicago's Merchandise Mart combined.

These ground installations, these heavy boosters, and the skill to use them, form a basic national resource; indeed, the ground facilities will serve most of the country's needs for space power for many years to come. And here I speak of the military as well as the NASA ground installations and boosters.

While proceeding with the development of the launch vehicles and spacecraft of the future -- more than 90 per cent of it under contract with American industry -- we have also learned the essentials of space operations, and have achieved a degree of reliability that has produced many specific achievements in space.

In 1958, the United States had five successful space flights, but for each success we had two failures. By 1961, out of 54 flights, the success ratio was five successes for each failure. In the first eight months of this year, every NASA launch has succeeded, with the exception of one Scout rocket fired from Wallops Island, Virginia.

In the Mercury program, we have experienced six successes -- or 100 per cent -- and greatly increased our knowledge of man's ability to adapt himself to weightlessness and to perform useful tasks under the conditions prevailing in space.

We launched successfully, on the first attempt, the Orbiting Solar Observatory, which has for 14 months provided valuable knowledge about the emission of energy from the sun.

Mariner II, the first successful attempt to approach another planet in our solar system, proved our ability to correct the course of a space vehicle in flight. You will remember when it was 2½ million miles from earth we altered its flight path by radio, so it would pass within 21,000 miles of Venus. Mariner II returned important scientific information about the cloud-wrapped planet when it was 36 million miles away from earth.

To NASA's science program has gone the assignment of investigating the nature of space -- its hazards, its properties, its peculiarities, and its variabilities.

Operating in space with sounding rockets, satellites and deep space probes -- but always from a base of ground laboratory work and theoretical research -- our program already has yielded important results.

For example, cooperative work by a NASA-funded team at the University of Minnesota and by a group at NASA's Goddard Space Flight Center in Maryland proved that the radiation hurled through space from a large solar flare would undoubtedly be fatal to the crew of a spacecraft unless they were provided with special shielding.

The same studies, however, demonstrated that enough shielding could be built into the Apollo spacecraft to protect its occupants. This kind of accurate knowledge is essential before large investments are made in space systems, military or commercial.

Study of the Sun is extremely important to all who would use space directly or employ knowledge gained from it to improve life on earth. The sun is the source of the vast majority of natural phenomena whose interplay make up our earth-space environment. By analyzing conditions near the earth, we can determine what hazards space travelers will face, but we must investigate the sun to learn the causes of these hazards. And from such investigations we hope to be able to forecast periods of especial danger.

We still do not know how the sun generates high-energy protons but a series of Orbiting Solar Observatories, launched over the next eleven years, will seek to discover what is responsible for these outbursts.

On Friday, September 20, 1963, a great solar flare took place. It did not produce a deadly proton shower near the earth but it did indicate that such a hazard is a possibility. NASA scientists issued a radio command to the Orbiting Solar Observatory, which at once began the specialized monitoring needed for more accurate flare predictions. The fact that the United States now has a sun-measuring laboratory in orbit is worth emphasizing because much of what science has heretofore known of solar physics stems from research done in the Soviet Union.

Time does not permit a detailed discussion of other areas of space science research, but here are some other examples worth mentioning quickly.

As I mentioned earlier, the first U.S. spacecraft, Explorer I, detected the great Van Allen radiation belts encircling the earth. This discovery was extremely important because these belts of radiation limit the regions accessible to manned space flights, civilian or military, and place other restrictions on our operations in space. They are like dangerous reefs to seamen or roads swept by the flames of forest fires to motorists.

Turning to studies of the upper reaches of the atmosphere, much has been learned about the ionosphere from a joint launching by the United States and Canada of the Alouette satellite in 1962.

The builders of high-speed, high-altitude aircraft and spacecraft need to know the structure of the earth's outer atmosphere in detail. A recent accomplishment in this area of research was the determination that the uppermost regions of the atmosphere consist chiefly of hydrogen and that below this region is a layer in which helium predominates. The presence of these lighter elements in large quantities has an important bearing on the design of craft which must travel through or re-enter the outer atmosphere.

In regions both near the earth and far from it, another major gain has been discovery of the existence of a solar wind -- that is, a continuous flow of charged particles from the sun.

Scientists, who only recently have been able to trap and study in satellites the mysterious substance known as cosmic dust, now hope to be able to map the character of this dust out as far as Venus and Mars.

In the field of meteorology, we have flown seven Tiros spacecraft, which have proved to be so valuable in providing data -- including more than 220,000 photographs of cloud patterns -- that they are now considered regular operational aids by the Weather Bureau.

In communications you have seen the clear trans-Atlantic TV broadcasts, and heard telephone conversations, transmitted by the low altitude Telstar and Relay. And with Syncom II, we have made a further advance by placing the craft at the high altitude of 22,000 miles in a synchronous orbit which, in effect, makes it hover over one position on earth. Three such spacecraft, in properly spaced orbits, could provide a continuous world-wide satellite communications system.

And in aeronautical research, the X-15 experimental aircraft has surpassed all its design qualifications. It has set unchallenged world records of 4,104 miles per hour for speed and 66½ miles for altitude. More important, the X-15 has yielded invaluable technical information about flight at the fringes of space, information that will aid in the design of the true aerospace vehicles of the future -- craft able to fly in both the atmosphere and space.

In the time available, I can touch on only some of the highlights of United States space activity during NASA's first five years. But I can assure you we have a well-balanced program that is broad enough and flexible enough to meet all national needs as the space age unfolds.

NASA is devoting appropriate attention to all major areas of space exploration. I have mentioned our progress with unmanned scientific spacecraft and our weather and communications satellites. And, of course, we are making a major effort to develop competence in manned spaceflight, because man is a far better explorer and observer than even the most sophisticated instruments, and also because manned flight beyond the atmosphere is the basis of national space power. Moreover, in our laboratories and research centers, and on university campuses, we must carry on fundamental investigations to prepare for the increasingly difficult space missions of the future and to make certain that in space technology we advance as rapidly as possible. Further, we are cooperating with the Department of Defense to develop the all-around space competence we must have to assure the nation's security.

Thus, in our space budgets and programs, we seek to strike the proper balance between the needs of basic science and our requirements for practical benefits, between civilian uses of space and potential military uses; between the demands for spacecraft to fly during this decade and the research that must be done now in order to develop the spacecraft of future decades.

As a nation, we are going through a new and vital experience in our efforts to master space. Our manned space flight program, despite its extreme technical difficulties is well underway, and we are making rapid progress.

The United States space team -- the industry-university-government team -- has undertaken the largest and most demanding task of research, of development, and of complex manufacture ever attempted by this or any other nation. Not only are we mobilizing the best of our existing resources but we are also greatly expanding our national capabilities in science and technology.

It will cost about $20 billion to develop the ability to send astronauts to explore the moon during this decade.

That is, the expenditure will be about $20 billion, <u>if</u> we maintain the momentum we have built up, <u>if</u> we follow the optimum schedule we have drawn up, and <u>if</u> we do not indulge in the false economies of stretch-out and slow-down.

Here let me point out what this $20 billion will be spent for. Very little will go for the actual expedition to the moon. The greater part will be invested in very powerful launch vehicles and the two-man and three-man spacecraft we must have to achieve across-the-board competence in all types of manned space missions which the national interests may require. Much of the investment will be devoted to the large and complex ground-support facilities that will serve our civilian and military needs for many years to come.

Exploration of the moon is certain to yield valuable scientific knowledge. However, the main purpose in setting lunar exploration as a major goal for this decade was to provide a focus for our efforts. Thus our aim in Projects Gemini and Apollo is to acquire all the basic skills and technology of manned space flight and overcome the Russian lead in this vital area in the shortest possible time, consistent with sound management of available resources while avoiding the waste of crash programs.

In other words, the main purpose of the moon flight itself will be to test and demonstrate our ability to overcome the formidable obstacles that, over the ages, have confined man to the planet earth.

Let me break this twenty billion dollar figure down further. About $7 billion will go for development of the Saturn I, the Saturn I-B, and the Saturn V rockets. The Saturn I, when we fly both stages as we hope to, later this year, will be the world's most powerful launch vehicle but it will not be significantly <u>more</u> powerful than the ones the Russians have been using for some years.

To make the big step forward to the moon and, perhaps, for other missions, we shall need the Saturn V, which we expect to launch in 1965 or 1966. Saturn V will be able to place in orbit a payload equal to 80 Mercury spacecraft such as John Glenn rode. Saturn V will be at least 15 times more powerful than any rocket the Russians are known to have launched to date. And this giant launch vehicle will be powerful enough to send a 45-ton payload to the moon or 35 tons to Venus or Mars.

Development work on manned spacecraft of this decade -- those for Mercury, Gemini, and Apollo -- will total about $6 billion.

Project Mercury took six Americans across the threshold of space.

Our upcoming two-man Gemini spacecraft will give experience of as much as two weeks in space flight near the earth and will enable them to begin drills in the essential art of space rendezvous.

Apollo missions will enable a three-man crew to orbit the earth for periods of up to two months. Project Apollo will carry out more difficult rendezvous maneuvers than those in Gemini. Apollo will enable astronauts to escape for the first time from the bonds of earth's gravity and finally to land on the moon and return safely home, entering the earth's atmosphere at a speed of 25,000 miles per hour.

In addition to $7 billion for the launch vehicles and $6 billion for the spacecraft, we shall also need $7 billion for supporting operations. This includes about $2 billion for ground facilities to test and launch the new rockets and spacecraft; about $1.5 billion for Project Mercury and the unmanned spacecraft which will reconnoiter the moon and investigate the dangers from solar flares; and about $3.5 billion to equip and operate the worldwide communications and tracking network and to pay salaries and expenses at the government research and development centers that support the manned space flight program.

To sum up what I have said here today, let me list the principal reasons why our investment in manned space flight is sound:

1. The current level of effort is vital if we are not to settle for second position in space. We must lead in space, and in other important fields of science and technology, if we are to lead the free world effectively and represent well the cause of democracy.

2. I have touched upon this before but I shall re-emphasize that almost all our advances in space technology will add directly or indirectly to our ability to deter aggression. The moon itself may have no apparent military value. Development of our ability to get there does. Rendezvous techniques, life-protection in space, the new control and guidance systems needed to reach the moon and return safely, and the far greater rocket power required for lunar exploration will all be of tremendous value to national defense.

3. The scientific capital we shall acquire in the lunar program will long serve the nation. For example, both robot and astronaut explorers of the moon should find there and report new information on how the earth and our solar system were formed. Not only will the moon be an unexcelled base for astronomical observations, but it may also serve as the staging area for further exploration of the solar system.

4. The facilities we are building and the technology we are acquiring are tangible assets that will extend benefits to our children and grandchildren.

5. The dollars that are putting us into space are being spent right here on earth. More than 90 per cent of all NASA funds go for contracts

with American industry. Thus our investments in space are stimulating the general economy. The ongoing national space program has a stabilizing effect on the economy when procurement of military aircraft and missiles slackens off.

6. In our accelerated programs of manned space flight, we are clearly demonstrating to the world the ability and determination of our democratic society to organize whatever large-scale scientific and industrial effort is required to meet critical national and international needs in time of peace as well as war. Even more important, we are gaining priceless experience in organizing and carrying out a national undertaking of unprecedented scope, difficulty, and may I add, promise. What we learn will help the United States and other nations cope with many of the unsolved scientific, technological, and social problems of our rapidly-changing world.

7. To meet the stringent demands of the space environment, yet save weight and bulk, engineers are developing new materials, new methods of construction, miniaturized electronics equipment, and new and more efficient sources of electrical and nuclear power, even harnessing the rays of the sun. Rapid progress is being made in such varied fields as new metals to withstand extreme heat and new techniques for manufacturing and handling extremely cold substances, such as liquid hydrogen. Automation, reliability, and the use of large and small computers are being emphasized. Such intensive technological pioneering sharpens the cutting edge of progress. It is certain to pay off dividends, many of which we cannot foresee, some of which may be of revolutionary nature.

8. We are rapidly building up a large pool of highly trained and creative scientists, engineers, and technicians. We are training men in government and in industry to meet the new responsibilities thrust on management by space science and technology.

9. We are currently devoting about one per cent of the country's income to the civilian space effort. If the excitement and inspiration of participating directly or indirectly in space exploration spurs our people to increase production of goods and services by only one per cent, the space program will pay for itself.

10. Our swift progress has now brought us to the point where our space power can be employed in peace-making as well as peace-keeping.

Because of the open nature of the NASA space program, it has been possible for the United States to conclude agreements for cooperation in space activities with more than 70 nations.

For example, we have launched satellites for Great Britain and Canada, and profited from the data obtained. We have joined with eight countries in scientific investigations made by sounding rockets. Thirty-seven countries have participated in our weather and communications projects. Thirty-three countries are working with us in the operation of our world-wide space-tracking networks. We are cooperating with the Italians in their San Marco project to launch the first satellite to circle the earth in a precise equatorial orbit. And NASA has established an international space fellowship program in our universities which will intensify scientific cooperation in the future.

I want to stress that no dollars are exported or funds exchanged in these cooperative programs. The nations participating supply their own shares of the costs and contribute scientific and technical personnel.

In conclusion, may I say that I have particularly enjoyed taking part in your 77th annual convention. Seven has a very happy connotation for all of us in NASA. You will recall that our original team of astronauts was 7 in number. They named their spacecraft Freedom 7, Liberty Bell 7, Friendship 7, Aurora 7, Sigma 7, and Faith 7.

The names of the Mercury spacecraft come close to stating in a concise way the reasons for our drive into space: Freedom; Liberty; Friendship; Aurora for the dawn of a new era; Sigma, a symbol of the engineer's great contribution to space flight; and Faith -- faith in ourselves, faith in America, faith in the future we are building.

May the double 7 on your convention program be as good an omen for you as 7 proved to be on our pioneering spacecraft. May you have a very successful and prosperous year.

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